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Sustainable Supply Chain System Model in Small and Medium Enterprise Furniture with Interpretive Structural Modeling (ISM) Approach

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ABSTRACT
SMEs furniture Pasuruan Indonesia is a business actor who processes wood from forest products into goods that can add value to wood production. This SMEs furniture is also one of the superior products of Pasuruan Regency. To optimize the potential of existing resources, the management of a sustainable supply chain strategy is needed. The management model of an integrated strategy is sustainable by utilizing quantitative data based on economic aspects, social aspects, environmental aspects and the influence of SMEs furniture. The evaluation method used for the sub-model of strategy formulation is the Interpretative Structural Modeling (ISM) approach. This strategy evaluation is based on internal factors and external factors from SMEs furniture. The purpose of this study is to determine various alternative strengthening strategies for key elements by structuring the strengthening system of supporting elements, inhibitors, strategies, actors and needs. Based on these five elements, the supporting elements are a priority for strengthening improvements in the sustainable supply chain system in furniture SMEs.
Keywords - Management strategy, SMEs , Furniture, ISM, Supply chain system.

I. INTRODUCTION

The SMEs furniture business is one of the pillars of the economy that is able to support the national economy to establish a strategy for strengthening business by preparing all the requirements for production activities. Pasuruan Regency currently has formulated 6 (six) excellent programs, namely: legal supremacy, quality education, marine and marine affairs, SMEs furniture and national trade, tourism, technology, and the environment. SMEs furniture as a superior program shows the commitment of the community and local governments to maximize their potential. Pasuruan SMEs furniture must consider industry competitive pressures and management capabilities when implementing competitive strategies to achieve optimal performance [1]. This condition illustrates the importance of establishing a strategy for strengthening furniture SMEs that optimizes the utilization of the total potential of the region as a basis for competitive advantage. The increasing contribution of furniture SMEs has an impact on improving the national economy, especially in the era of free trade. Indonesian SMEs also have a very important and strategic role in becoming a strong, independent and superior industry [2].

SMEs furniture as a business in Pasuruan Indonesia is able to create jobs, absorb labor and increase the income of local people [3]. The problem of SMEs furniture is because the supply of raw materials is less, the production yield is low, while the demand for consumer needs is high, so SMEs are not able to meet consumer needs according to product demand. Based on these problems, a sustainable supply chain system is needed. In an effort to support the supply chain system, a strategy management model is integrated with the Interpretative Structural Modeling (ISM) approach. ISM provides a fundamental understanding of complex situations and solving problems with computer-based modeling [4]. Previous research also used ISM to identify strengths and dependencies in business management and sustainable supply chain knowledge [5]. ISM is a method of analyzing qualitative data used to understand and identify the interrelationships between components in sophisticated and complex systems [6,7]. ISM is based on group decision making, social science, graph theory, and computer assistance [8]. The ISM methodology is to calculate binary matrices,

to explain individual / reciprocal relationship elements [9].

Based on a survey in the field and interviews with parties related to SMEs furniture, several indicators were found that were different from previous studies, namely a continuous supply chain strengthening system in furniture SMEs using 5 elements with 53 sub-elements. Referring to [10, 11, 12] to support consumer loyalty so as not to move with other products, a sustainable supply chain system is carried out.

The concept of strategy in controlling the level of efficiency and effectiveness of SMEs furniture needs to be considered by decision makers. Furniture SMEs have the potential to develop well, along with increasing market demand and supported by sufficient sources of raw materials. Small and Medium Enterprises (SMEs) have a strategic role in building the national economy [13, 14]. Procurement of raw materials that are not yet in line with the expectations of SMEs, so their needs must be met by replanting to unproductive forests with better forest management. Meanwhile, the policy in developing SMEs to succeed in the long-term vision of the program is a modern industry that is cultured in order to build a rural-based industry, as a fairly prospective step.

The purpose of this study is to engineer management model with integration to study the strengthening elements through supporting evaluation, inhibitors, strategies, actors, and needs, using Interpretative Structural Modeling (ISM) analysis tools. Therefore this study determines the evaluation of the strategy by conducting a study of the interaction between the availability of resources based on the assessor (ISM).

II.   LITERATURE REVIEW
2.1. Interpretative Structural Modeling (ISM)

ISM is a method for solving complex problems based on structural mapping of interconnection attributes involving qualitative and interpretative by transforming them into multi-level structural models [15]. The ISM also describes complex systems into sub-systems where multi-level structure models can be built [16]. This method explains the direction of system attributes and identifies influences. ISM defines the problem by means of dependency and driving power to build relationships between certain attributes [15, 17].

The ISM calculation has several steps as follows [15]:
1. Identification of elements; system elements are identified and listed, this can be obtained through research, brainstorming and others.
2. Contextual relationships: a contextual relationship between elements is built, depending on the purpose of modeling.
3. Single Structural Self Interaction Matrix (SSIM). This matrix represents the elements of respondents' perceptions of the intended relationship element. The four symbols used to represent the type of relationship that exists between the two elements of the system under consideration are:
   a. V, the relationship of the element ei to ej, not the other way around.
   b. A, the relationship of the ej element to ei, not vice versa.
   c. X, the interrelation relationship between ei and ej (can be the opposite).
   d. O, indicates that ei and ej are not related.
4. Reachability Matrix / RM Matrix; a prepared RM then converts SSIM symbols into a binary matrix with the conversion rules as follows:
   a. V if eij = 1 and eji = 0.
   b. A if eij = 0 and eji = 1.
   c. X if eij = 1 and eji = 1.
   d. O if eij = 0 and eji = 0.
   The definition of eij = 1 is a contextual relationship between i and j sub-elements, while eij = 0 is there is no contextual relationship between subdivisions to i and to j.
5. The level of participation is done to classify elements in different levels of the ISM structure.
6 Canonical Matrix; grouping elements in the same level develops this matrix. The resultant matrix has most of the triangular elements which are more than 0 and the lowest is 1. This matrix is then used to prepare diagraph.
7. Graph; is a graph of elements that are directly related and the level of the hierarchy.
8. Interpretative Structural Model; ISM is generated by moving the entire number of elements with a description of the actual element, therefore the ISM provides a very clear picture of the system elements and their relationship path.

Broadly speaking, the classification of management strategies is divided into 4 sectors, namely:
1. Sector I: weak driver - weak dependent variable (autonomous), this sector is not related to the system and may have a slight relationship, in position: Drive Power (DP) value ≤ 0.5 X and Dependent (D) value ≤ 0.5X, with X is the number of sub-elements.
2. Sector II: weak driver - strongly dependent variable (dependent), this sector is included in the sub element that is not free with position: DP value ≤ 0.5 X and D value> 0.5X.
3. Sector III: strong driver - strongly dependent variable (linkage), this sector enters the relationship between the unstable sub-elements, enters the position: DP value> 0.5 X and D value> 0.5 X.
4. Sector IV: strong driver - weak dependent

variable (independent), this sector enters the remaining part of the system and the independent variable, enters position: DP value> 0.5 X and D value ≤ 0.5 X.

2.2. Furniture Supply Chain Structure Model

Structural models are made with the aim to understand the behavior of the system as a whole after the identification of the relationships between the sub-elements of the system in each system element [5, 18]. The relationship between sub-elements of the system in each element of the system is analyzed using the ISM method. Based on literature review and expert opinion, important system elements in the furniture supply chain in Pasuruan Regency are supporting elements, inhibiting elements, strategic elements, actors' elements, and elements of need.

The structural elements and sub-elements of the supply chain strengthening system are formulated through the identification of SWOT factors to obtain five elements, namely:

1. Supporting elements (p) furniture supply chain strengthening system with 10 sub-elements.
2. The inhibiting element (k) is a reinforcement system with 10 sub-elements.
3. Element of strategy (s) strengthening system with 9 sub-elements.
4. The element of the actor (m) a reinforcement system with 12 sub-elements.
5. Element needs (u) strengthening system with 11 sub-elements.

The structuring model of reinforcement systems is enriched by the study of elements to determine the reinforcement system that is formed in the contextual relationships of the reinforcement system, as follows (Table 1):

Table 1. Strengthening elements and sub-elements

No.	Element Strengthening	Sub-elements
1	Support (p)	1. Availability of teak trees (p1). 2. The geographical position of East Java - Indonesia (p2). 3. Indonesian National Forest Company and farmer land ownership (p3). 4. New innovations in planting teak trees (p4). 5. Production capacity for product variations (p5). 6. Priority program priority policy (p6). 7. Potential of local and regional markets (p7). 8. Variation in product quality and quantity (p8) 9. Regional autonomy policy (p9). 10. Transportation of production shipments (p10).
2	Inhibitor (k)	1. The concept of strengthening the supply chain strategy is inconsistent (k1). 2. Less product quality guarantee (k2). 3. Raw materials do not match (k3). 4. Market access is not open (k4). 5. Limited production technology (k5). 6. Capital limitations (k6). 7. Prices are stable (k7). 8. Competitors of foreign products (k8). 9. A decrease in wood supplies has an impact on the amount of production down (k9). 10. Bureaucratic rules, policies, and performance measures do not support each other (k10).
3	Strategy (s)	1. Strengthening regional Superior-based supply chains (s1). 2. Strengthening the supply chain according to market demand (s2). 3. Pasuruan as a gateway for SMEs furniture product sales (s3). 4. Development of cooperative institutions, partners, banks, and (s4). 5. There is SMEs furniture data information center (s5). 6. Development of production and marketing skills (s6). 7. Investment and trade policy (s7). 8. Collaboration with capital, marketing, and technology (s8). 9. Technology as needed (s9)
4	Actor (m)	1. Indonesian National Forest Company (m1) 2. Farmers/garden owners (m2) 3. Wood Processing Industry (m3) 4. SMEs furniture (m4) 5. Timber & furniture business associations (m5) 6. Investor (m6) 7. Banking / Financial Institution (m7) 8. Government (Regional and Central) (m8) 9. Research Centers / Universities (m9) 10. Consumer (m10) 11. environmentalists (m11) 12. Cooperative (m12)

5	Need (u)	1. High skill ability (u1) 2. Availability of capital institutions (u2) 3. Policy on establishing furniture sales gates (u3) 4. Availability of data information center (u4) 5. Stable product price (u5) 5. Determination of rules and policies for guaranteeing SMEs (u6) 6. Increased income of actors in the supply chain (u7) 7. Availability of quality control/product quality institutions (u8) 8. Procurement of market analysis institutions (u9) 9. Availability of technological resources (u10) 10. Guarantee the quality and quantity of product supply (u11)

Analysis of the relationship between sub-elements is done by the ISM-VAXO technique. Through the acquisition of expert opinion, data was obtained in the form of SSIM Matrix which was then transformed into Reachability matrix binary numbers. After transitive testing, the final Reachability Matrix (RM) relationship between sub-elements was obtained. The key sub-elements of the reinforcement system are based on the maximum power driver (DP) value, which is the total relationship between the sub-elements and the highest level (L) which is indicated by the lowest dependent (D).

III. RESEARCH METHODS

The method stages in this study are:

Stage 1: Identify the determination of sustainable supply chain strengthening indicators.

This identification is determined based on several aspects, namely economic, social and environmental aspects, while the influence of identification on SMEs furniture is the diversity of SMEs, regional characteristics, optimization of the role of SMEs and the relevance of SMEs behavior. The reinforcement element in this study consists of supporting elements, officials, strategies, actors and needs. All elements of strengthening the sustainable supply chain can be seen in table 1

Stage II : ISM Analysis and Implementation.

This stage is to determine the need to design or engineer a supply chain system that is implemented in the Indonesian Department of SMEs furniture. This implementation is determined based on self-evaluation studies with the methods of strength, weakness, opportunity, threats (SWOT). The supporting element is strengthening the internal data furniture supply chain according to the strength factor (S) and opportunity factor (O) which consists of 10 sub-elements. The supporting elements for strengthening the furniture supply chain in selecting each sub-element are determined using 5 respondents. The chosen respondents are people who fully understand the conditions in the furniture supply chain system. Opinions from each respondent can be trusted because they are very competent in their fields.

Stage III : Evaluation and Modeling of Sustainable Supply Chain Systems

Based on the implementation of the previous stage, it was determined the evaluation and modeling of the Sustainable Supply Chain System. This stage is an evaluation of the strategy by conducting a study of the interaction between the availability of resources and strengthening strategies in the preparation of various strengthening scenarios. Based on the results of the evaluation and modeling, key sub-elements can be identified from the supporting elements, officials, strategies, actors, and needs. Phase I to stage III is found in Figure 2. Stage I to stage III can be seen in Figure 2.
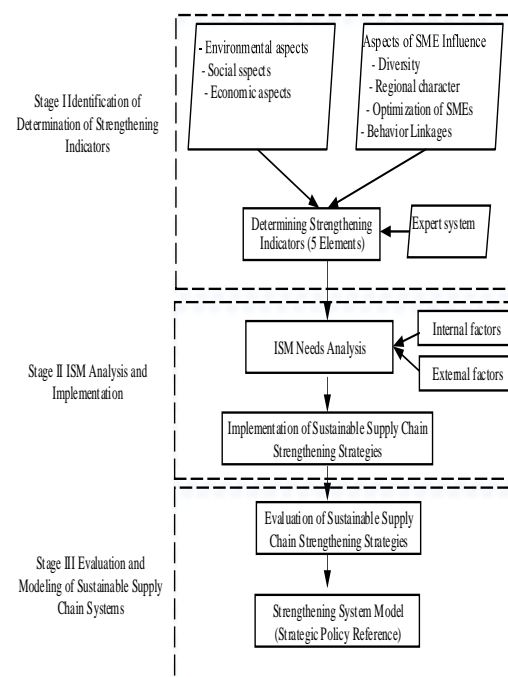

Figure 2. Research Method

IV. RESULTS AND DISCUSSION

4.1. System Description

The method used in this research is Interpretative Structural Modeling, while the technique of combining respondents' data uses the initial mode of the matrix reachability matrix (RM)

data of each respondent. Analysis of the relationship between the sub-elements of reinforcement support is done by the ISM-VAXO technique. Expert opinion data is poured into the Structural Self Interaction Matrix (SSIM) and transformed into binary numbers in the form of a Reachability Matrix (RM) matrix, after which transitivity testing is performed.

4.2. ISM Simulation and Analysis

The stages in ISM simulation and analysis are:
1. Determine the comparison of each sub-element.

   In this study to determine the comparison of each element using a comparison between the supporting sub-elements of expert opinion in the form of the ISM-VAXO matrix found in table 2.

Table 2. Reachability Matrix of Supporting Elements

Symbol	p1	p2	p3	p4	p5	p6	p7	p8	p9	p10
p1		V	X	X	O	O	A	X	V	V
p2			V	X	X	V	O	V	V	V
p3				X	A	V	V	X	X	O
p4					A	X	V	V	O	X
p5						O	X	V	V	V
p6							X	V	A	A
p7								O	V	V
p8									V	V
p9										A
p10										

2. Convert Reachability Matrix (RM) into binary numbers on the supporting sub-elements.

   This step is determined based on the results of the opinions of competent experts in their field, then poured in the SSIM matrix and transformed into binary numbers in the form of a Reachability Matrix (RM) matrix as in table 2. Reachability Matrix is obtained by converting data from letters V, A, X and O to binary numbers (0 and 1). In compiling the RM is done by calculating the respondent's answer mode data. Cell mode is obtained by calculating the number of figures that appear most (data mode), can be seen in table 3.

Table 3. Reachability Matrix of Supporting Elementary Binary Numbers

Symbol	p1	p2	p3	p4	p5	p6	p7	p8	p9	p10
p1	1	1	1	1	0	0	0	1	1	1
p2	0	1	1	1	1	0	0	1	1	1
p3	1	0	1	1	0	0	1	1	1	0
p4	1	1	1	1	0	1	1	1	0	1
p5	0	1	1	1	1	0	1	1	1	1
p6	0	1	1	1	0	1	1	1	0	0
p7	1	0	0	0	1	1	1	0	1	1
p8	1	0	1	0	0	0	0	1	1	1
p9	0	0	1	0	0	0	0	0	1	0
p10	0	0	0	1	0	0	0	0	1	1

3. Adjustment of Reachability Matrix of Supporting Elements

This step is used to adjust the binary number with the aim of getting the rank (R), Driver Power (DP), Level (L), and Dependent (D) values. The DP value is obtained by summing the binary number in a row. The R-value is obtained by sorting the DP value. The D value is obtained by adding up the binary number in one column. The value of L is obtained by sorting the value D. The results of the table from the process of adjusting twinkle numbers from the opinions of experts in the reachability matrix relationship between the supporting sub-elements can be seen in table 4.

Table 4. Reachability Matrix of Adjustment of Supporting Elements

Symbol	Intervention Of Supporting Sub-Elements Supply Chain System										DP	R
	p1	p2	p3	p4	p5	p6	p7	p8	p9	p10		
p1	1	1	1	1	0	0	0	1	1	1	7	3
p2	0	1	1	1	1	0	0	1	1	1	7	2
p3	1	0	1	1	0	0	1	1	1	0	6	4
p4	1	1	1	1	0	1	1	1	0	1	8	3
p5	0	1	1	1	1	0	1	1	1	1	8	1
p6	0	1	1	1	0	1	1	1	0	0	6	1
p7	1	0	0	0	1	1	1	0	1	1	6	3
p8	1	0	1	0	0	0	0	1	1	1	5	4
p9	0	0	1	0	0	0	0	0	1	0	2	6
p10	0	0	0	1	0	0	0	0	1	1	3	5
D	5	5	8	7	3	3	5	7	8	7		
L	4	5	3	4	6	6	4	3	1	2		

4. Determine the final Reachability Matrix in the supporting sub-elements

   The final Reachability Matrix (RM) value is obtained by testing the transitive properties in each cell until the final RM is generated in accordance with the ranking sequence of supporting sub-elements in table 5. Ranking DP values based on R values, are p5, p6, p2, p1, p4, p7, p3, p8, p10, p9. The value of D is based on L values, namely p9, p10, p3, p8, p1, p4, p7, p2, p4, p5. Based on table 5 the highest ranking DP value is the production capacity of product variation (p5), the priority program is the flagship program (p6). Sub-elements p5 and p6 are used as key sub-elements in supporting elements, while the highest level in value D is regional autonomy policy (p9).

Table 5. Final Reachability Matrix Supporting Elements

Symbol	Intervention Of Supporting Sub-Elements Supply Chain System										DP	R
	p1	p2	p3	p4	p5	p6	p7	p8	p9	p10		
p1	1	1	1	0	0	0	0	1	1	1	6	3
p2	0	1	1	1	1	0	0	1	1	1	7	2
p3	1	0	1	0	0	0	1	1	1	0	5	4
p4	1	0	0	1	0	1	1	1	0	1	6	3
p5	0	1	1	1	1	0	1	1	1	1	8	1
p6	0	1	1	1	0	1	1	1	1	1	8	1
p7	1	0	0	0	1	1	1	0	1	1	6	3
p8	1	0	1	0	0	0	0	1	1	1	5	4
p9	0	0	1	0	0	0	0	0	1	0	2	6
p10	0	0	0	1	0	0	0	0	1	1	3	5
D	5	4	7	5	3	3	5	7	9	8		
L	4	5	3	4	6	6	4	3	1	2		

5. Determine the model structure of the supporting

sub-hierarchy

Based on the output of the ISM-VAXO Model, the hierarchical structure of relations between the supporting sub-elements of the superior furniture SMEs reinforcement system consists of 6 levels as shown in Figure 3. In accordance with the assumption that the one supporting sub-element influences the benefits of other supporting sub-elements then the model hierarchy shows that the sub-elements at a level are supported by the fulfillment of sub-elements at the level below.
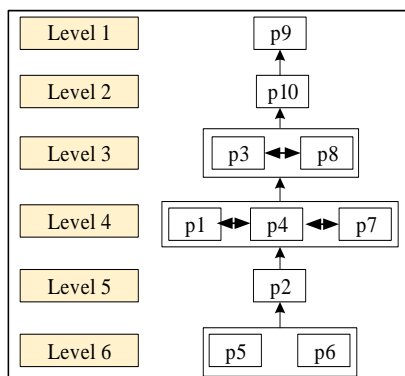

Figure 3. Model of the Hierarchy of Supporting Sub-Elements

Arrange classification diagrams and structural models of sub-elements by sorting in coordinates of the Power Driver and Dependence values in the calcification image. The next output of the ISM-VAXO Model is the classification of the reinforcement sub-elements found in Figure 3.

6. Determine the ranking and classification of supporting sub-elements.

The ranking and classification of supporting sub-elements in this study is the production capacity of product variation (p5) and the priority program of flagship program (p6) as the highest level and in sector IV coordinates (3,6), found in table 6.

Table 6. Rank of Supporting Sub Elements

No.	Sub-Elements	Rank	Sector (Coordinate)
1	Availability of teak trees (p1).	3	II (5,4)
2	The geographical position of East Java - Indonesia (p2).	2	IV (4,5)
3	Indonesian National Forest Company and farmer land ownership (p3).	4	II (7,3)
4	New innovations in planting teak trees (p4).	3	II (5,4)
5	Production capacity for product variations (p5).	1	IV (3,6)
6	Priority program	1	IV (3,6)

	priority policy (p6).		
7	Potential of local and regional markets (p7).	3	III (5,4)
8	Variation in product quality and quantity (p8)	4	II (7,3)
9	Regional autonomy policy (p9).	6	II (9,1)
10	Transportation of production shipments (p10).	5	II (8,2)

The output of the ISM-VAXO model shows the position of sub-elements (p5, p6) as a key sub-element supporting the superior furniture SMEs strengthening system in Pasuruan Indonesia which occupies the highest level (level 6) with the largest total DP. The entire supporting sub-elements of the reinforcement system are grouped based on the level of driver power and the level of dependency into four quadrants, namely: Sector I (Autonomous); Sector II (Dependent); Sector III (Linkage) and Sector IV (Independent), can be seen in Figure 4.
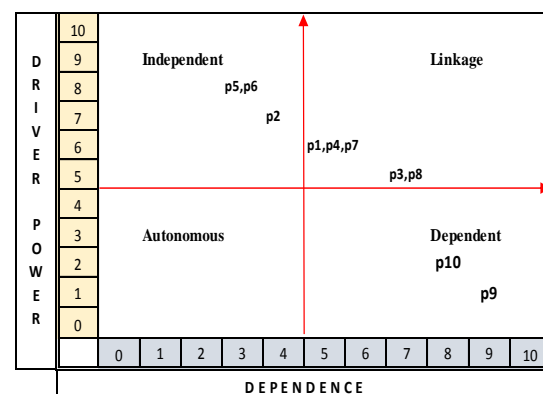

Figure 4. Classification of Sub-Elements Supporting SMEs Furniture Strengthening Systems

The grouping results in Figure 4 show that there is no reinforcement sub-element that is not related to the system (Autonomous sector = 0). Sub-elements p1, p3, p4, p7, and p8 are in the Linkage sector. This means that the relationship between sub-elements is unstable but is very relaxed and has an impact on other variables, especially in the Dependent sector variable. Classification also shows that in the Dependent sector there are several sub-elements (p2, p5, p6) which are non-independent variables that are highly dependent on inputs and actions are given to the system (Independent sector) with independent variables (p10, p9). The process of analyzing SMEs furniture reinforcement on inhibiting elements, strategies, actors, and needs, is carried out with the same steps as in the supporting elements.

Based on this study, the results of the sub-blockers are bureaucratic rules, policies, and performance measures that are not mutually supportive (k10), the result of sub-strategy is making Pasuruan Regency a gateway for SMEs furniture product sales (s3), building cooperative development, partners, banking, and non-governmental organization (environmentalists) (s4), building an information center on furniture SMEs data (s5), sub Actors are cooperatives (m12), and the results of sub-needs are the availability of capital institutions (u2)The grouping results in Figure 4 show that there is no reinforcement sub-element that is not related to the system (Autonomous sector = 0). Sub-elements p1, p3, p4, p7, and p8 are in the Linkage sector so they must be studied carefully because the relationship is not stable but is very relaxed and has an impact on other variables, especially in the Dependent sector variable.

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V.   CONCLUSIONS

The evaluation of the strategy of strengthening the supporting sub-elements shows that efforts to strengthen production capacity are needed to meet the needs of consumers with variations in the types of SME furniture products and priority policy setting for the flagship program in Pasuruan sector IV (Independent) at coordinates (3,6). The scenario of strengthening SME furniture needs to be reviewed in the formulation of strategies and their implementation. Key sub-supporting elements are production capacity that is able to meet the needs of consumers with various types of furniture SMEs products. Determination of priority programs for superior programs in Pasuruan

Regency is a bureaucratic rule, policies and performance measures that are not mutually supportive, sub-strategies are to make Pasuruan Indonesia as a gateway for the sale of furniture SMEs products, building institutional development of cooperatives, partners, banks, and Non-governmental organization (environmentalists) (s4), building data centers for furniture SMEs, sub-actors are cooperatives, and sub-needs are the availability of capital institutions.

REFERENCES

[1]. Omsa, S., Salim, U., Djumahir, & Rahayu, M., 2015. Competitive Strategy Orientation and Company Performance Selected SMEs Wooden Furniture in Pasuruan City, I J A B E R, Vol. 13, No. 7 : 4659-4676.

[2]. Indarti, N., 2018. Small and Medium Business Empowerment Actors through Capacity Building at Furniture Industry in Pasuruan City, International Journal of Civil Engineering and Technology (IJCIET), Vol. 9, Issue 7, pp. 789–799.

[3]. Indarti, N., 2015. Entrepreneurship Coaching Role as a Realization of Furniture Industry Empowerment in Pasuruan towards Independence, IOSR Journal Of Humanities And Social Science (IOSR-JHSS), Vol. 20, Issue 11, Ver. IV , PP 101-105.

[4]. Singh, M.D. Kant, R., 2008. Knowledge management barriers: An interpretive structural modeling approach, International Journal of Management Sciences and Engineering Management, Vol. 3, No. 2, pp. 141-150.

[5]. Ming K. Lim, Tseng, M., Tan, K. H., Tat, T. D., 2017. Knowledge Management in Sustainable Supply Chain Management: Improving Performance through an Interpretive Structural Modelling Approach, Journal of Cleaner Production, Vol. 162.

[6]. Warfield, J. N., 1974. Developing Interconnection Matrices in Structural Modeling, IEEE Transactions on Systems, Man, and Cybernetics, Vol. SMC-4, no. 1, pp. 81–87.

[7]. Horisch, J., Ortas, E., Schaltegger, S., & Alvarez, I., 2015. Environmental Effects of Sustainability Management Tools: an Empirical Analysis of Large Companies, Ecological Economics, Vol. 120, pp. 241-249.

[8]. Narayanaswamy, V., & Stone, L., 2007. From cleaner production to sustainable production and consumption in Australia and New Zealand: achievements, challenges, and opportunities, Journal of Cleaner Production, Vol. 15, no. 8-9, pp. 711-715.

[9]. Dubey, R., Gunasekaran, A., Papadopoulos, T., Childe, S. J., Shibin, K., & Wamba, S. F., 2017. Sustainable Supply Chain Management: Framework and Further Research Directions, Journal of Cleaner Production, Vol. 142, pp. 1119–1130.

[10]. Ahi, P., & Searcy, C., 2015. An Analysis of Metrics used to Measure Performance in Green

and Sustainable Supply Chains, Journal of Cleaner Production, Vol. 86, pp. 360-377.

[11]. Mathiyazhagan, K., Govindan, K., NoorulHaq, A., & Geng, Y., 2013. An ISM Approach for the Barrier Analysis in Implement Green Supply Chain Management, Journal of Cleaner Production, Vol. 47, pp. 283-297.

[12]. Yang, M., Movahedipour, M., Zeng, J., Xiaoguang, Z., & Wang, L., 2017. Analysis of Success Factors to Implement Sustainable Supply Chain Management Using Interpretive Structural Modeling Technique: A Real Case Perspective, Mathematical Problems in Engineering, Article ID 7274565, https://doi.org/10.1155/2017/7274565

[13]. Rahmanita, E., Tri, W. V., & Kustiyahningsih Y, 2018. Adaptive FANP and TOPSIS Method for Innovation Strategy of Small Medium Enterprise (SME). Int. Journal of Engineering Research and Application, Vol. 8, Issue 2, pp.75-80, ISSN : 2248-9622.

[14]. Kustiyahningsih, Y., Rahmanita, E. &Purnama, J., 2016. Integration Balanced Scorecard and Fuzzy Analytic Network Process (FANP) for Measuring Performance of Small Medium Enterprise (SME). Journal of Theoretical and Applied Information Technology (JATIT), 94(2), pp. 343-352.

[15]. Mangla, S.K., Kumar, P., & Barua, M.K., 2014. Flexible Decision Approach for Analysing Performance of Sustainable Supply Chains Under Risks / Uncertainty, Glob. J. Flexible Syst. Manag, Vol. 15 (2).

[16]. Watson, R.H., 1978. Interpretive structural modelling: a useful tool for technology assessment, Technol. Forecast. Soc. Change, Vol. 11(2).

[17]. Tripathy, S., Sahu, S., & Ray, P. K., 2013. Interpretive Structural Modelling for Critical Success Factors of R & D Performance in Indian Manufacturing Firms. Journal Model Management, Vol. 8(2), pp. 212-40.

[18]. Tseng, M.L., Chiu, A.S., 2013. Evaluating firm's green supply chain management in linguistic preferences. Journal Clean Production, Vol. 40, pp. 22-31.